APPENDIX

```
rem *** Inertia Friction Welding Inc
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rem
rem
rem *** Inertia Friction Welding Inc
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rem
rem *** #MAIN
rem This is the main program task
#MAIN
JS #INIT
XQ #IDLE,1
#MAIN1
JS #CYCLE,(@IN[1]=0:
JS #HOME,HPB=1:
JS #WELD1,RPB=1:
JP #MAIN1
EN
rem End #MAIN********************
rem *** Inertia Friction Welding Inc
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rem
rem *** #HOME
rem Home function
#HOME
HX 1;
HPB=0;
MG "HOME"
XYHomed=0;
HomeIP=1;
RevLS=0;ForLS=0;
ER HomeFE;
AC HomeAcc;
DC HomeDec;
KP HomeP;
KI HomeI;
KD HomeD;
IL 2;VT 1;
#HOMEX
MG "Homing . . .";
```

```
StatMsg="HOMEX:"
rem Make sure of home switch
MG "Get off home switch . . . ";
JG HVel:BGX;
#WFX2:JP #WFX2,(@IN[2]=0;
WT 500
STX:AMX:JP #HOMEX,@IN[2]=0;
MG "Off Home switch . . . ";
rem Find home LS
MG "Looking for home switch . . . ";
#WFX1;
PR -5;HG:AMX;
JP #WFX1,(@IN[2]=1;XPos= TPX;
MG "Home switch found . . . ";
rem
rem Go back to home position
SP HVel;
PA XPos:BG:AM:DP0;
MG "Slides Homed . . . "
#HOME1
XYHomed=1;
XQ #IDLE,;
EN
rem End #HOME********************
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rem
rem *** #POSERR
rem Position following error
#POSERR
ZS;
JS #HALT;
MG "FOLLOWING ERROR"
StatMsg="FOLERR"
ZS:Jp #MAIN;
RE
rem End #POSERR ··················
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rem
rem *** #HALT
rem Brings motion to a stop
#HALT
StatMsg="HALT"
ER*=10000:II 0:AB 1:WT 1000;
SH,CS:HX 1:MO;
OP255;
rem JS #CLEARIO;
MG "Servo program halted . . . "
EN
rem end #HALT ···················
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rem
#IDLE
IdleTM=TIME
#IDLE1
JP #IDLE1,TIME-IdleTM<1000;
ITime=ITime+1;
MG "Servo Ready . . . ",ITime(F0)
JP #IDLE;
EN
rem End #IDLE ···················
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rem
#INIT
SB 1:SB 2:SB 3:SB 4;
SB 5:SB 6:SB 7:SB 8;
ER*=1000;
OE*=1;
TL 1;
GN 1;
AC 500;
DC 500;
```

```
KP .2;
KI .C5;
KD 0;
HPB=0;
RPB=0;
XYHomed=0;
IdleTM=0;
ITime=0;
JS #INITGL
JS #INITWL
EN;
rem End #INIT ***************
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rem
#WELD1
HX ;
RPB=0;
MG "Weld Cycle Started"
ER*=WeldFE;
OE*=1;
rem
TL WeldTL;
GN WeldGN;
SP WeldSP;
AC WeldAC;
DC WeldDC;
KP WeldKP;
KI WeldKI;
KD WeldKD;
Dist=PPR*WeldRev;
Dist2=Dist-(PPR*TrigRev);
PR Dist;
TW 500;
BGX;
MG "Scrub . .  "
rem Scrub start
AT 0;
AT ScrubTM;
rem Burn start
CB1;
MG "Burn . . . "
AD Dist2;
rem WT500
rem Forge Start
CB 2;
SB 1;
MG "Forge . . . "
AMX;
KP WeldKP2;
WT ForgeTM;
SB 2
MG "Weld complete"
WT 10C00
KP WeldKP.
EN;
rem End #WELD1 ******************
rem
#CYCLE
JS #HOME,XYHomed=0
JS #WELD1;
XQ #IDLE,1
EN
rem End #CYCLE ******************
#MCTIME
MG "Position timeout . . . "
RE
rem End WELD/CYCLE MODULE ********
rem
#INITGL
rem
rem GLOBAL VARIABLES
rem
rem
rem PULSES PER INCH
PPI=1000.00C00)
rem PULSES PER REV
PPR=7941.22449
```

```
rem Timer Ticks Per Second
TPS=1000
rem    Input Volts Per Unit
IVltPRPM=2.000000
IVltPPSI=3.000000
rem    Output Volts Per Unit
OVltPRPM=2.000000
OVltPPSI=3.000000
rem Sample Rate
SampleRt=100
rem Number of IO
rem Homing following error counts
HomeFE=2000;
HomeVel=1000;
HomeAcc=500;
HomeDec=500;
HomeP=.8;
HomeI=.02;
HomeD=0;
GHomeVel=1000;
FTVel=1000;
rem Software limits
XFLimit=11.000
YFLimit=11.000
XBLimit=-0.100
YBLimit=-0.100
InvertIO=1
rem Max Move Values
MaxXMVel=10
MaxXMAcc=40
MaxXMDec=40
EN
rem
rem Weld start values
#INITWL
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rem
rem Weld specific params
WeldRPM=1750
ScrubTM=2000;
ForgeTM=4000;
WeldRevS=10
Degrees=0
TrigRev=0.5
rem
rem PID params
WeldAcc=100
WeldDec=100
WeldKP=0.5
WeldKP2=1
WeldKI=0.02
WeldKD=50
WeldFErr=1.5
WeldTL=9.9988
WeldGN=20
rem
rem Calculated parameters
WeldRev=(Degrees/360)+WeldRevS;
WeldSP=(WeldRPM*PPR)/60;
WeldAC=(WeldAcc*PPR)/60;
WeldDC=(WeldDec*PPR)/60;
WeldFE=WeldFErr*PPR;
rem
rem End weld.txt ************
EN
rem End #INITLW ****************
```